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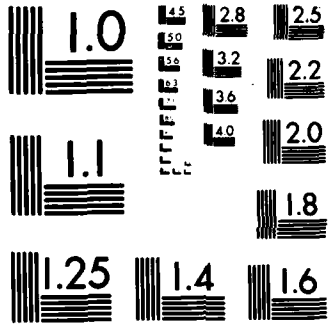

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MINI-RAFT BACK PACK DEVELOPMENT

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report reviews NAVAIRDEVCEN's development of the Mini-Raft from 1972 to the present time with emphasis on the latest improvements in the technical and operational characteristics prior to OPEVAL.

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TABLE OF CONTENTS

LIST OF FIGURES

BACKGROUND

Helicopters, unlike fixed wing aircraft, lack glide capability and an ejection system. Consequently, the helicopter pilot generally relies on autorotation to make an emergency landing of his disabled aircraft; and when making an emergency landing on water, the rapid sinking rate of the helicopter requires immediate egress of personnel. To ensure that all crewmen have the necessary survival equipment to await rescue in water, all survival equipment must be man-mounted.

The current U.S. Navy One Man Life Raft, LR-1, is packaged into an 18 x 12 x 2 inch configuration, weighs about 3.2 kg (7 lb), and is worn across the small of the wearer's back. The inflated LR-1 resembles an inner tube with a floor, and when in the water, is difficult to board and to bail, is unstable and uncomfortable. Wearing this raft during flight causes fatigue and tension which downgrades the wearers' normal flight performance, and emergency egress from a sinking helicopter is impeded.

Possible solutions to this problem are: (a) an externally mounted, automatically expelled multiplace life raft, or (b) flotation bags to float the helicopter. These approaches are under investigation and are long term efforts. Another solution, an improved one-man life raft, called a Mini-Raft, has been developed by the Naval Air Development Center and is described in this report.

A breadboard model of this Mini-Raft, less the container, was developed during the 1972 to 1975 time period, and in 1975 a redesigned Mini-Raft was satisfactorily pool tested at the NAVAIRDEVCEN. Updated models were satisfactorily tested in 1976; and Technical Evaluation (TECHEVAL) was completed in 1981.

PURPOSE

The purpose of this report is to provide a history of the Mini-Raft Backpack development from its concept to a point prior to Operational Evaluation (OPEVAL). This phase report, combined with future Mini-Raft Backpack phase reports, will provide program administrators with a complete overview of the Mini-Raft Backpack development; and will retain pertinent information for future reference.

SYSTEM DESCRIPTION AND USE

The Mini-Raft Backpack System is composed of the Mini-Raft, its components, and its fabric container, as shown in Figures 1A and 1B.

The Mini-Raft is a one man life raft fabricated from heat sealable polyurethane coated cloth composed of two inflatable cells. Its main, or primary, buoyancy is obtained by inflating the CO_2 Inflation Chamber by means of a 56 gram CO_2 bottle using a standard inflation assembly. Secondary buoyancy can be added by orally inflating the oral inflation chamber by using the top oral inflator shown in Figures 2 and 3. Supplmentary buoyancy can be added to top-off the CO_2 chamber by using the bottom oral inflator, also shown in Figures 2 and 3. It should be noted that the oral inflator for the CO_2 chamber

is partially covered by a cloth pocket shown in Figure 3.

The fabric container dimensions are 13 x 13 x 2 inches, and is made of Polyamid (MIL-C-81814) material. As shown in Figures 1A and B, the container forms a pocket to facilitate Mini-Raft packing and reduce inadvertent openings; and accommodates the folded Mini-Raft by means of snap fasteners and hook and pile closures. It is light, strong, fire resistant, and resistant to pilling. It is worn in the small of the subject's back, securely sewn to a belt of nylon webbing which fits waist sizes from 27 to 47 inches, and is buckled in front by a snap hook and ring, as shown in Figure 4.

The Mini-Raft Backpack system is properly donned by ensuring that the lettering on both sides of the container is right-side-up, with the lettering, "THIS SIDE AGAINST BODY," worn as shown in Figure 5, against the body. The back view of Mini-Raft is shown in Figure 6.

Upon entering the water during a ditching emergency, the subject pulls the Mini-Raft beaded handle to actuate the CO_2 bottle to inflate the CO_2 chamber of the raft. The inflation of the raft automatically forces the snap fasteners and hook and pile closures of the container to open, permitting the raft to attain its design shape. Figure 7 shows the uncovered CO_2 Inflation Assembly; Figure 8 shows the subject inflating the oral inflation chamber.

SYSTEM MISSION

Helicopter crewmen, during emergency ditchings in water, require a flotation platform to enhance their survival until rescued. The raft must provide the minimum acceptable flotation and insulative properties required during inclement weather conditions to sustain life during the short term rescue period. The Mini-Raft is compatible with all standard U.S. Navy rescue swimmers and search and rescue procedures.

TECHNICAL AND OPERATIONAL CHARACTERISTICS

TECHNICAL CHARACTERISITICS

The Technical and Operational Characteristics of this Mini-Raft Backpack System were presented in the Test and Evaluation Master Plan (TEMP) No. 807. The same characteristics are presented as follows with the addition of up-to-date achievements.

Characteristic	Threshold	Achievements To-Date
a. Weight	4.0 lbs.	4.0 lbs.
b. Packaged Size	13"x13"x2"	13"x13"x2"
c. Time to inflate CO_2 Chamber in 68°F Ambient	30 seconds	15 seconds
d. Time to orally inflate top chamber	4 minutes	1-2 minutes

Characteristic	Threshold	Achievements To-Date
e. Time to bail raft from 18" to 5" from bottom	4 minutes	1 minute
f. Raft integrity: CO_2 pressure test in CO_2 inflation chamber	5 psi	5 psi
g. Permeability test of CO_2 inflation chamber	2 psi for 4 hours	2 psi for 4 hours
h. Permeability test of oral inflation chamber	2 psi for 4 hours	2 psi for 4 hours

Prior to OPEVAL, the above Technical Characteristics of this system have undergone progressive improvements, approaching or exceeding program goals. Information pertinent to the achievements of these goals is as follows:

The 4.0 pound goal for total system weight has been achieved by utilizing light weight polyurethane coated cloth for the Mini-Raft and light weight Polyamid material for the Container.

The time required to inflate the CO_2 chamber has been reduced to 15 seconds in a 68°F ambient.

The time required to orally inflate the top chamber has been timed at the Patuxant River Test Center to vary from 1 to 2 minutes, with a maximum of 3.5 minutes.

The time to bail the raft from 18 inches to 5 inches has been reduced from 4 minutes to 1 minute.

The CO_2 pressure tests for raft integrity shall be performed at the factory at a 100% rate to achieve 5 psi for 10 minutes.

The permeability test of the CO_2 and oral inflation chambers shall be tested at the 100% rate at the factory to achieve 2 psi for 4 hours; and for scheduled maintenance, 1 psi shall be achieved for 4 hours.

TECHNICAL DATA PACKAGE

A technical data package, with tested specifications and drawings, is available and has been proven in production.

OPERATIONAL CHARACTERISTICS

The Operational Characteristics of the Mini-Raft Backpack System are presented, as follows, with the addition of up-to-date achievements.

The compatibility for use with the helicopters listed above, is somewhat conditional: When aircrewmen are mobile, no problems exist; however, when subjects at Patuxant River were tested in aircraft seats with built-in lumber supports, the combined thickness of the MIni-Raft Backpack and the lumber support were found to be uncomfortable. Tests results at Ft. Rucker conflicted with those of Patuxant River thereby requiring additional Army tests.

The raft was not lifted by rotor wash during Patuxant River testing of helicopters hovering at 30 to 50 feet above the raft. No one was in the raft and tests were first run with the raft ballasted with 24 inches of water and then unballasted.

OPERATOR AND MAINTENANCE FAMILIARIZATION TAPES, AND MAINTENANCE MANUAL

Video tapes for Operator Familiarization and Maintenance Familiarization have been completed and are available for use. The Maintenance Manual is complete and available for use.

CONCLUSIONS

The Mini-Raft Backpack System has been satisfactorily evaluated for use aboard NAVY ASW, utility, transport, and attack helicopters and is presently being scheduled for OPEVAL. OPEVAL will utilize this system's advanced developmental models which will contain the latest technical and operational characteristics, and achievements.

The CO_2 and Oral Inflation Systems are highly reliable subsystems of the Mini-Raft that have been in fleet use for over ten years on a number of different inflatables. The Mini-Raft utilizes both of these system with the oral chamber independent of the CO_2 chamber; and either chamber, when inflated, is capable of supporting a subject in water. In addition, the system is 100% inspected prior to issue and every 90 days thereafter.

Consequently, it becomes extremely improbable and unlikely that the CO_2 and Oral Inflation Systems, or the raft and its separate chambers fail simultaneously.

It is expected that OPEVAL will prove the Mini-Raft Backpack System to be highly reliable and acceptable to operator and maintenance personnel.

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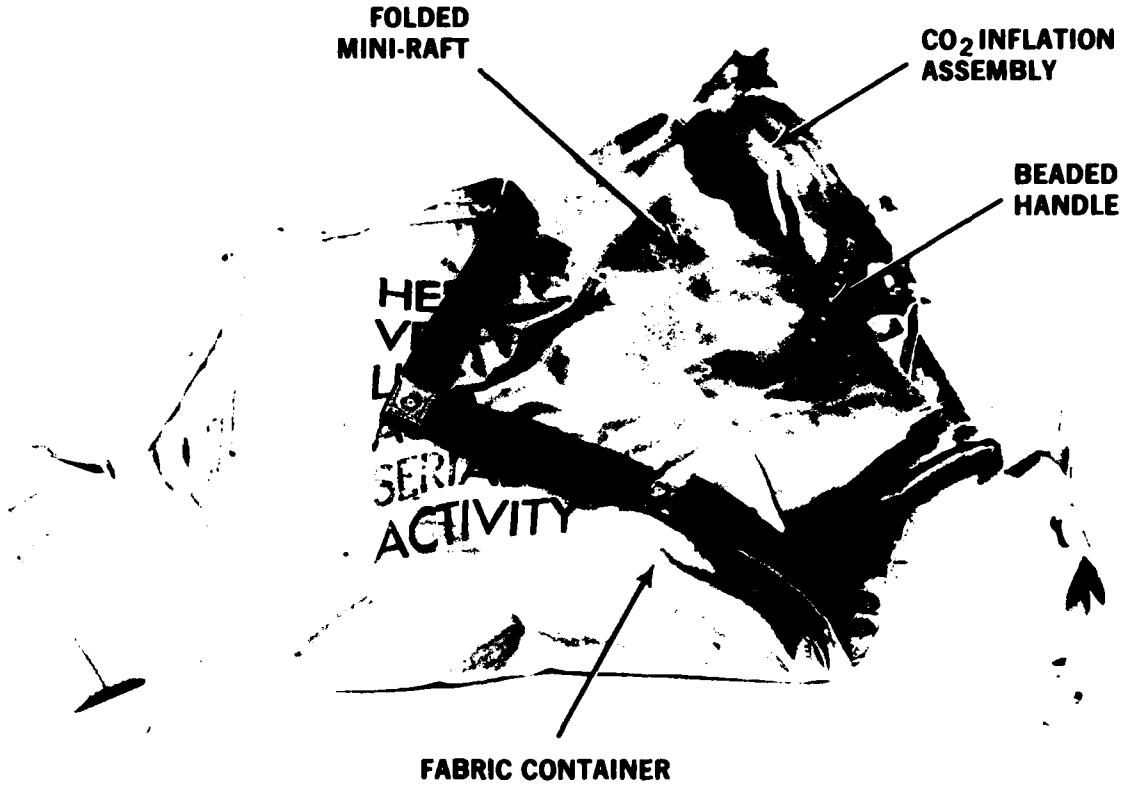
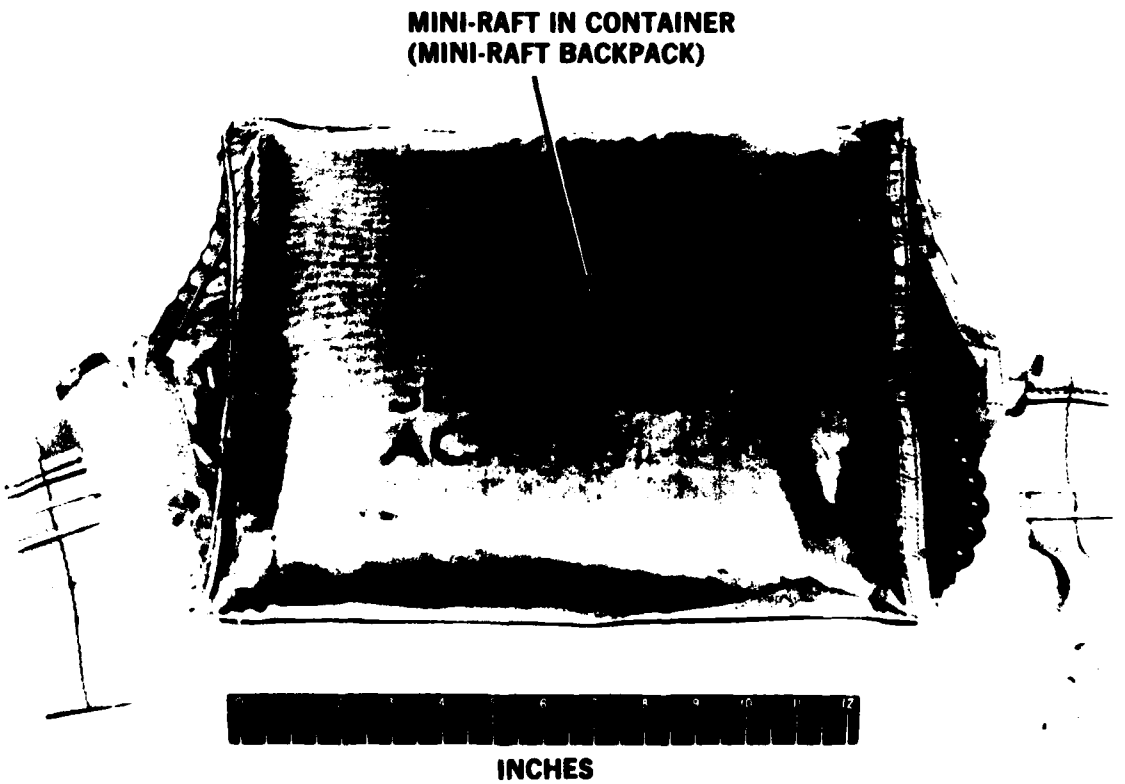
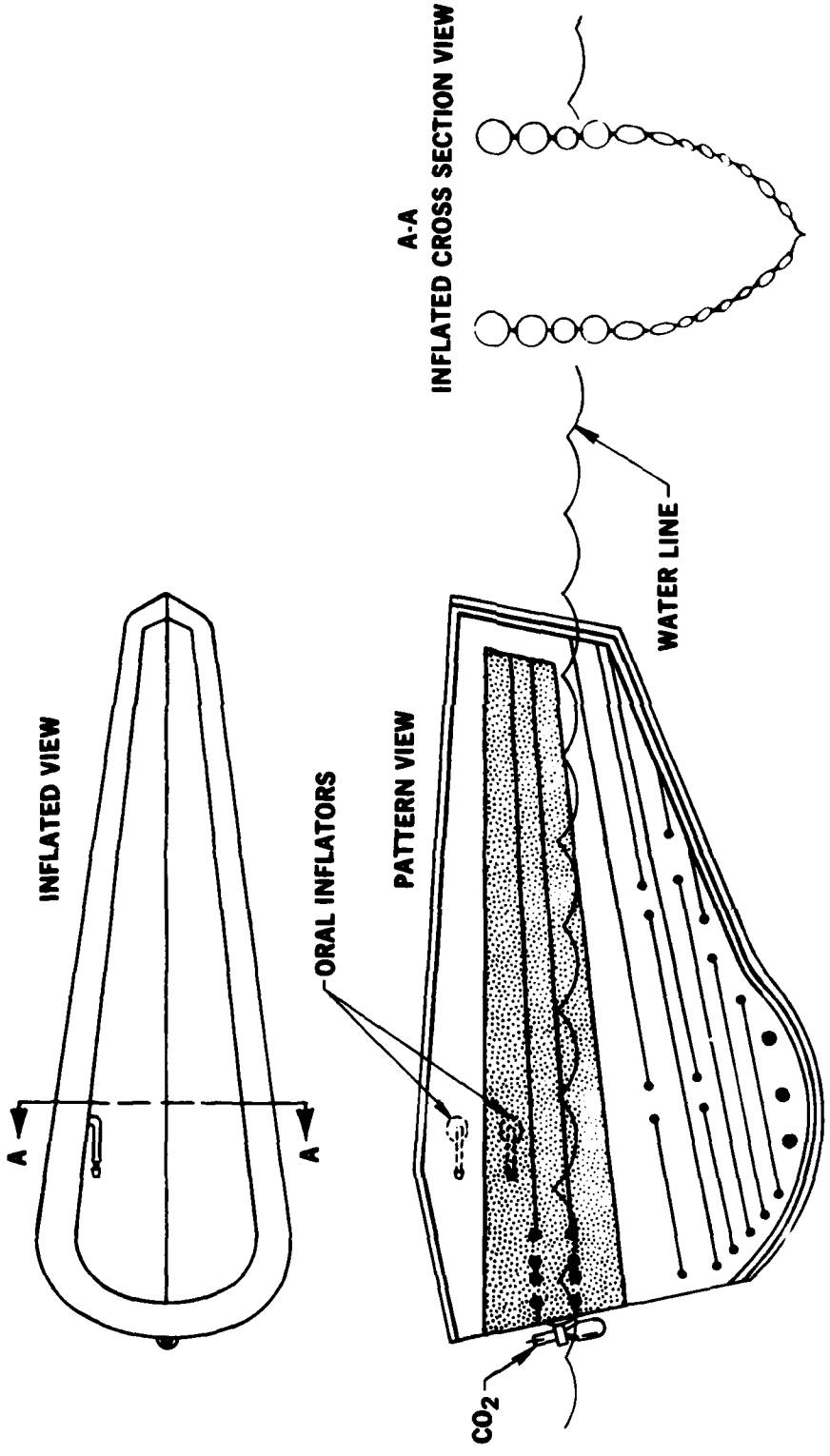




MINI-RAFT BACKPACK AND IT'S COMPONENTS

Figure 1



MINI-RAFT

Figure 2

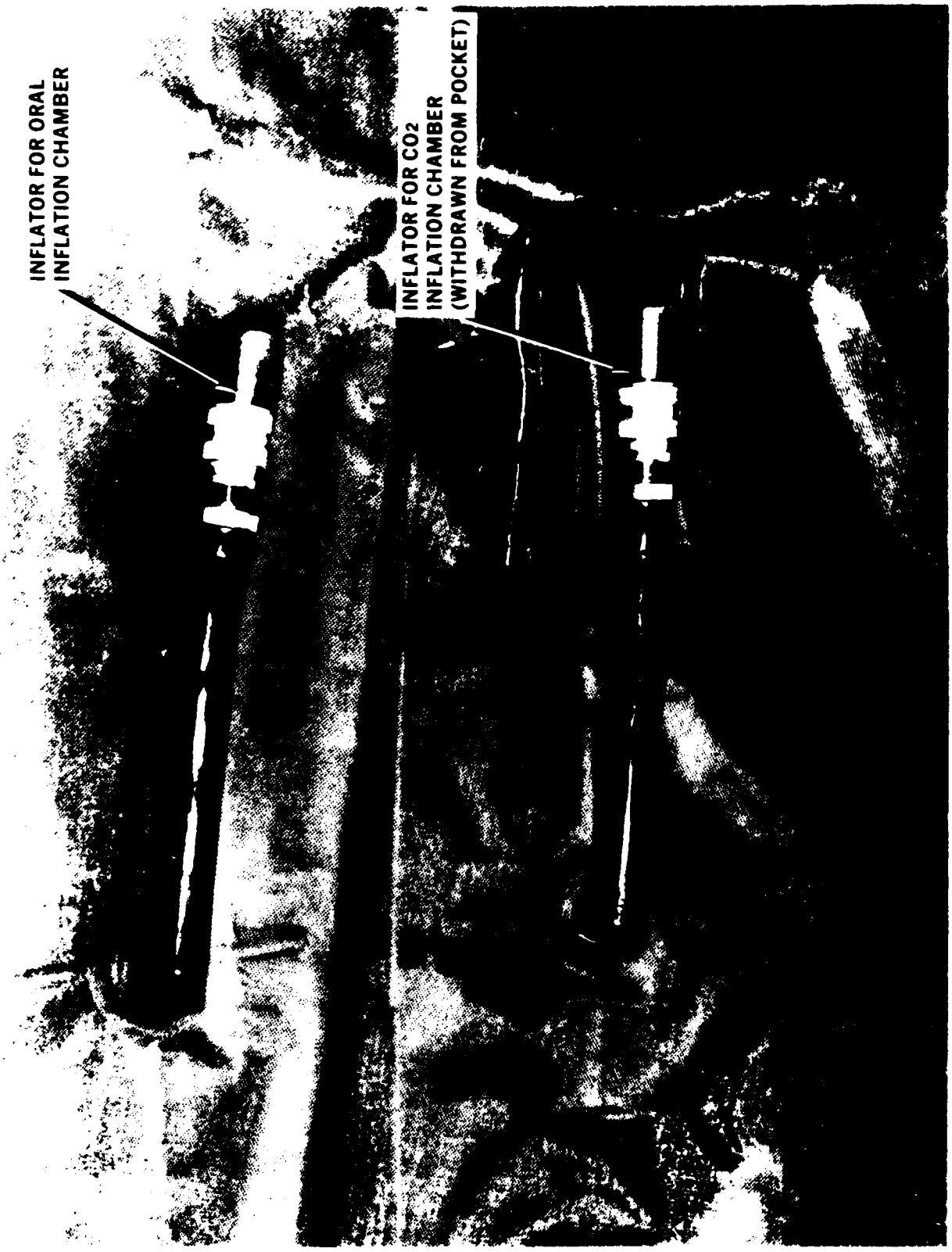


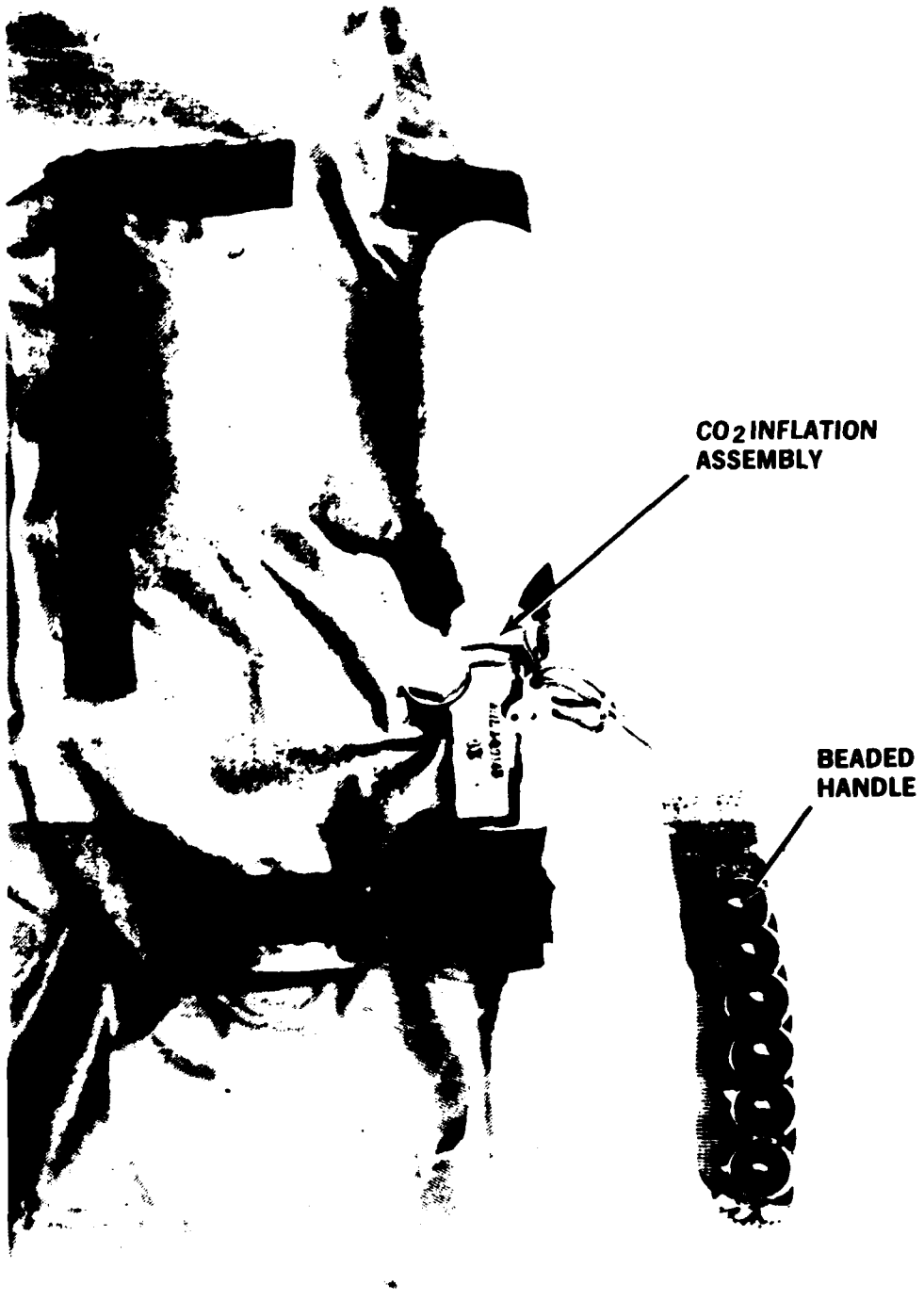
FIGURE 3. ORAL INFLATORS

FIGURE 4. MINI-RAFT BUCKLING SYSTEM

FIGURE 5. DONNING OF MINI-RAFT BACKPACK

MINI-RAFT BACKPACK WORN IN SMALL OF SUBJECT'S BACK

Figure 6



CO_2 INFLATION ASSEMBLY

Figure 7

SUBJECT IN MINI-RAFT, INFLATING ORAL INFLATION CHAMBER

Figure 8

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